

# CASE 3

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Westlaw.

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United States Court of Appeals,  
Federal Circuit.  
MINCO, INC., Plaintiff/Cross-Appellant,  
v.  
COMBUSTION ENGINEERING, INC., Defendant-  
Appellant.  
Nos. 96-1005, 96-1033.

Sept. 10, 1996.

Rehearing Denied; Suggestion for Rehearing In Banc  
Declined Nov. 18, 1996.

Patentee brought infringement action against competitor, alleging infringement of its patent for a rotary furnace used to fuse minerals. The United States District Court for the Eastern District of Tennessee, Thomas Gray Hull, J., entered judgment in favor of patentee, 903 F.Supp. 1204, and appeal was taken. The Court of Appeals held that: (1) patent was literally infringed; (2) patent satisfied best mode requirement; (3) patentee had been assigned right to sue for past damages; (4) evidence supported award of lost profit damages; (5) evidence supported award of reasonable royalty damages; (6) patentee was not entitled to recover price erosion damages; and (7) patentee was not entitled to recover lost profits on competitor's sale of its business.

Affirmed.

## West Headnotes

**[1] Patents** ⚡101(2)291k101(2) Most Cited Cases

Under patent for rotary furnace used to fuse minerals, claim calling for two crane supports for lifting and tilting housing and removing contents, did not require that crane supports actually lift and tilt furnace housing; it was evident to one of ordinary skill in rotary furnace operations that crane supports alone did not lift furnace, but rather crane lifted weight of furnace supports and facilitated lifting process by connecting furnace to crane.

**[2] Patents** ⚡168(2.1)291k168(2.1) Most Cited Cases

Change in claim language during reexamination of patent for rotary furnace used to fuse minerals, indicating that crane support was to lift and tilt housing rather than to lift and tilt furnace, as originally indicated, did not give alleged infringer intervening rights; change was made in response to examiner's suggestion that crane did not lift entire furnace system, including external drive wheels, and one of ordinary skill in the art would understand that claims not specify lifting and tilting entire furnace system.

**[3] Patents** ⚡104291k104 Most Cited Cases

Claims, although amended during reexamination, retain their original effective date unless changed in scope from original patent.

**[4] Patents** ⚡324.5291k324.5 Most Cited Cases

Court of Appeals reviews without deference district court's conclusion that reexamined patent claims remain identical in scope.

**[5] Patents** ⚡98291k98 Most Cited Cases

Compliance with statutory best mode requirement focuses on state of mind of inventor at time inventor files patent application; accordingly, inventor's intent controls. 35 U.S.C.A. § 112.

**[6] Patents** ⚡314(5)291k314(5) Most Cited Cases**[6] Patents** ⚡324.55(2)291k324.55(2) Most Cited Cases

Trier of fact determines compliance with best mode requirement; following bench trial, Court of Appeals, in turn, reviews that finding for clear error. 35 U.S.C.A. § 112.

**[7] Patents** ⚡98291k98 Most Cited Cases

To invalidate patent under best mode requirement, accused infringer must show by clear and convincing evidence that inventor both knew of and concealed better mode for carrying out claimed invention then was set forth in specification; record must show that

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inventor considered alternative modes superior to disclosed mode. 35 U.S.C.A. § 112.

#### **[8] Patents** ➡ **98**

##### 291k98 Most Cited Cases

If inventor appreciates best mode for carrying of invention, invalidity may result from failure to disclose, regardless of whether inventor specifically intended to conceal his or her best mode. 35 U.S.C.A. § 112.

#### **[9] Patents** ➡ **98**

##### 291k98 Most Cited Cases

Patent for rotary furnace used to fuse minerals satisfied best mode requirement, although patent drawings depicted one crane support off center to top left of furnace housing, and furnace operated by patentee based on patent used two crane supports, one close to each end; inventor testified that patentee's crane support configuration was production decision, not superior method of operation, required because it had added more tires to its drive system, and that he did not intend to conceal best mode. 35 U.S.C.A. § 112.

#### **[10] Patents** ➡ **98**

##### 291k98 Most Cited Cases

Before inventor can conceal best mode, record must first show his or her appreciation of superiority of one mode over those modes disclosed in specification. 35 U.S.C.A. § 112.

#### **[11] Patents** ➡ **193**

##### 291k193 Most Cited Cases

Parties may transfer patent rights by legal agreement.

#### **[12] Patents** ➡ **196.1**

##### 291k196.1 Most Cited Cases

#### **[12] Patents** ➡ **206**

##### 291k206 Most Cited Cases

Conveyance of interests in patent typically constitutes either assignment or mere license; assignment of patent rights operates to transfer title to patent, while license leaves title in patent owner.

#### **[13] Patents** ➡ **202(1)**

##### 291k202(1) Most Cited Cases

#### **[13] Patents** ➡ **286**

##### 291k286 Most Cited Cases

Assignee holds title to patent and may sue for in-

fringement without further permission or clearance; licensee, however, cannot sue without joinder of patent owner.

#### **[14] Patents** ➡ **196.1**

##### 291k196.1 Most Cited Cases

To create assignment, contract must transfer: entire exclusive patent right, undivided interest in patent rights, or entire exclusive right within any geographical region of the United States; agreement that does not transfer one of these three interests is merely a license.

#### **[15] Patents** ➡ **226**

##### 291k226 Most Cited Cases

#### **[15] Patents** ➡ **286**

##### 291k286 Most Cited Cases

Infringement harms only owner of patent at time of infringing act; thus, conveyance of patent does not normally include right to recover for injury occurring to prior owner. 35 U.S.C.A. § 271.

#### **[16] Patents** ➡ **286**

##### 291k286 Most Cited Cases

Generally, right to sue for prior patent infringement is not transferred unless assignment agreement manifests intent to transfer that right; neither statute nor common law precedent, however, requires particular formula or set prescription or words to express that conveyance. 35 U.S.C.A. § 271.

#### **[17] Patents** ➡ **202(1)**

##### 291k202(1) Most Cited Cases

Determining whether right to sue for prior patent infringement has been transferred turns on proper construction of assignment agreement, which is matter of state contract law.

#### **[18] Contracts** ➡ **143.5**

##### 95k143.5 Most Cited Cases

#### **[18] Contracts** ➡ **152**

##### 95k152 Most Cited Cases

In construing contractual language under Tennessee law, written words of intent receive their usual, natural, and ordinary meaning; moreover, entire context of contract informs meaning of any particular term.

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**[19] Contracts** ¶143.595k143.5 Most Cited Cases

Under Tennessee law, one provision in agreement may modify, limit, or illuminate another.

**[20] Patents** ¶202(1)291k202(1) Most Cited Cases

Patent assignment agreement transferring all of assignor's "right, title, and interest" transferred right to sue for past infringement, where assignment noted that assignor had received all "right, title, and interest" from his predecessor, including "all rights of action and damages for past infringement"; express reference to past infringement in assignment expanded scope of term "right, title, and interest" to encompass right to sue for past infringement. 35 U.S.C.A. § 271.

**[21] Patents** ¶319(1)291k319(1) Most Cited Cases

Because fashioning adequate damages award in patent infringement case depends on unique economic circumstance of each case, trial court has discretion to make important subsidiary determinations in damages trial, such as choosing methodology to calculate damages. 35 U.S.C.A. § 284.

**[22] Patents** ¶318(2)291k318(2) Most Cited Cases

To recover lost profits, patent holder must show that infringer actually caused economic harm for which patentee seeks compensation. 35 U.S.C.A. § 284.

**[23] Patents** ¶312(10)291k312(10) Most Cited Cases

In context of lost profit damages in patent infringement case, causation requires evidence of reasonable probability that patent holder would have made asserted profits absent infringement.

**[24] Patents** ¶324.55(2)291k324.55(2) Most Cited Cases

Court of Appeals reviews trial court's finding of causation, as required to award lost profit damages in patent infringement case, for clear error. 35 U.S.C.A. § 284.

**[25] Patents** ¶312(1.7)291k312(1.7) Most Cited Cases

In addition to causation, patent holder seeking to recover lost profit damages bears burden of proving amount of award. 35 U.S.C.A. § 284.

**[26] Patents** ¶324.55(2)291k324.55(2) Most Cited Cases

Quantum is issue of fact, which Court of Appeals reviews for clear error on appeal from lost profits award in patent infringement case. 35 U.S.C.A. § 284.

**[27] Patents** ¶312(10)291k312(10) Most Cited Cases

Once patentee show causation, trial court may resolve doubts underlying precise measurement of damages against infringer; nevertheless, burden remains on patentee to prove amount by preponderance of evidence. 35 U.S.C.A. § 284.

**[28] Patents** ¶319(1)291k319(1) Most Cited Cases

Assessment of adequate damages, under patent infringement damages statute, does not limit patent holder to amount of deferred sales of commercial embodiment of patented product; rather, patent holder may recover for injury caused by infringement if it was or should have been reasonably foreseeable by infringing competitor in relevant market, broadly defined. 35 U.S.C.A. § 284.

**[29] Patents** ¶312(10)291k312(10) Most Cited Cases

Evidence that patent for rotary furnace for fusing minerals produced marketable fused minerals and that both patentee and infringer used invention to compete in market established that infringer should have reasonably foreseen that infringement of patent would harm patentee's sales, and supported award of lost profit damages. 35 U.S.C.A. § 284.

**[30] Patents** ¶312(10)291k312(10) Most Cited Cases

Evidence was sufficient to establish that competitor's infringed rotary furnace for fusing minerals diverted sales from patentee and supported award of \$3,455,329 in lost profits in infringement case, despite evidence that market featured noninfringing alternatives to patent and that infringer could have de-

signed around patent; evidence indicated that patentee's fused silica product was in significant demand, and there was no evidence of marketplace use of purported substitute by infringer or any other fused silica manufacturer. 35 U.S.C.A. § 284.

**[31] Patents ⚡318(2)**

291k318(2) Most Cited Cases

Patent Act permits damages award to encompass both lost profits and reasonable royalty on that portion of infringer's sales not included in lost profit calculation. 35 U.S.C.A. § 284.

**[32] Patents ⚡318(4.2)**

291k318(4.2) Most Cited Cases

Segment of infringer's sales may not warrant lost profits award because patentee cannot establish causation for that segment. 35 U.S.C.A. § 284.

**[33] Patents ⚡318(4.1)**

291k318(4.1) Most Cited Cases

District court may calculate reasonable royalty in infringement case by postulating hypothetical negotiation between willing licensor and licensee at time infringement commenced; this hypothetical construct seeks percentage of sales or profit likely to have induced hypothetical negotiators to license use of invention. 35 U.S.C.A. § 284.

**[34] Patents ⚡312(10)**

291k312(10) Most Cited Cases

Evidence in action for infringement of patent for rotary furnace used to fuse minerals supported award of reasonable royalty damages at rate of 20% on gross value of infringer's sales; infringer and patentee were direct competitors, infringer had inferior product at time of infringement, market contained no noninfringing alternatives, infringer regarded invention a significant advance, and industry enjoyed high rates of profit. 35 U.S.C.A. § 284.

**[35] Patents ⚡312(10)**

291k312(10) Most Cited Cases

To prove price erosion damages, patentee must show that, but for infringement, it would have been able to charge higher prices. 35 U.S.C.A. § 284.

**[36] Patents ⚡312(10)**

291k312(10) Most Cited Cases

Evidence that price of fused silica declined during period competitor infringed patent for a rotary furnace used to fuse minerals was insufficient to support award of price erosion damages in patent infringement case; patentee's average selling price increased during first year competitor sold fused silica from infringing furnaces, and patentee was market leader in cutting prices. 35 U.S.C.A. § 284.

**[37] Patents ⚡319(1)**

291k319(1) Most Cited Cases

Patentee that established that its competitor's furnace infringed its patent for a rotary furnace used to fuse minerals was not entitled to portion of proceeds from sale of competitor's business, although sale included infringing kilns; patentee did not prove that infringing kilns were important factor in sale or that it was entitled to compensation beyond lost profits and reasonable royalties. 35 U.S.C.A. § 284.

\*1112 James R. Higgins, Jr., Middleton & Reutlinger, Louisville, Kentucky, argued for plaintiff/cross-appellant. With him on the brief were Thomas P. O'Brien, III. Of counsel were Robert E. Pitts, R. Bradford Brittan, Melinda L. Doss, and Raymond E. Stephens, Pitts & Brittan, Knoxville, Tennessee. Also of counsel was Charles R. Terry, Terry, Terry & Stapleton, Morristown, Tennessee.

Gary M. Ropski, Willian Brinks, Hofer Gilson & Li-one, Chicago, Illinois, argued for defendant-appellant. With him on the brief were John J. Pavlak, Cynthia A. Homan, and Curt J. Whitenack.

Before RADER, Circuit Judge, COWEN, Senior Circuit Judge, and SCHALL, Circuit Judge.

PER CURIAM.

In this patent infringement case, Combustion Engineering, Inc. (CE) appeals and Minco, Inc. cross-appeals a final decision of the United States District Court for the Eastern District of Tennessee. The patent at issue, 4,217,462 (the '462 patent), claims a rotary furnace for fusing minerals. The district court found CE willfully infringed claims 3 and 4 of the '462 patent. The court also found that these claims were neither invalid nor unenforceable and that laches did not apply. The court awarded damages of

\$3,455,329 and a reasonable royalty of \$7,408,179.40. Because the infringement was willful, the court doubled the damages for an overall award of \$21,727,016.80 plus attorneys fees and pre-judgment interest. Because the record supports the district court's findings and conclusions, this court affirms.

#### \*1113 BACKGROUND

As one way to fuse silica, an operator first puts high purity sand into a barrel-shaped, rotary furnace. External drive wheels then rotate the furnace to throw the sand against the furnace walls. Graphite electrodes then enter the furnace through openings at either end. These rods create a high energy arc which heats and fuses the silica. Finally, the operator dumps the ingot of fused silica out of the furnace. Once crushed, the fused silica has many applications, particularly in semiconductor technology.

CE and its predecessor produced fused silica and fused magnesia. During 1976-1977, CE used a rotary "jumbo kiln" to fuse these minerals. In July 1977, CE released Ken Jenkins, who then began experimenting in his barn to solve problems in fusion furnaces, such as CE's jumbo kiln. With input from another former CE employee, William Rawles, Jenkins developed the claimed furnace. This new furnace more efficiently produced a better quality of fused silica than CE's jumbo kiln.

In September 1977, Jenkins and his sister Verneil Richards formed Minco, Inc. to produce fused silica. Ultimately, they used their new rotary furnace in that endeavor. Fused silica from their invention enjoyed substantial commercial success. The new furnace produced fused silica with less discoloration and lower iron contamination than CE's product. Many purchasers found these qualities commercially attractive. Minco's net sales increased annually from 1979 through 1985.

In May 1978, Jenkins and Rawles filed a patent application claiming, in claims 1 and 2, their rotary furnace. In April 1979, they filed a continuation-in-part application adding claims 3 and 4. These added claims covered a rotary furnace in combination with crane supports for lifting and tilting the furnace hous-

ing. In August 1980, the '462 patent issued.

Before October 31, 1988, Minco owned no rights in the '462 patent. On February 23, 1988, Rawles assigned his interest in the '462 patent to Richards, "including all rights of action and damages for past infringement." On October 31, 1988, Minco Acquisition Corporation (MAC), an investment group formed to acquire Minco, purchased Minco and the patent from Jenkins and Richards. This transaction included three documents:

- (1) a long form patent assignment, assigning the '462 patent from Jenkins and Richards to MAC;
- (2) a short form of the first assignment for recording the assignment at the PTO; and
- (3) an assignment of the '462 patent from MAC to Minco.

At the behest of CE and others, the patent underwent reexamination. During reexamination, the Patent and Trademark Office (PTO) found claims 1 and 2--directed to only the rotary furnace--obvious in view of prior art. After modification, claims 3 and 4 issued to Minco on October 12, 1993. These claims are directed to a rotary furnace "for the continuous electric heating and/or fusion of mineral bearing substances." The furnace comprises a number of features including "a cylindrical housing, said housing having a first conical extension fixed to one end thereof and a second removeable conical extension detachably secured to an opposite end thereof." The claims also specify "a crane support mounted upon each said housing and removable conical extension for lifting and tilting the housing to remove the contents thereof." (Emphasis omitted). In allowing claims 3 and 4, the examiner reasoned: "[N]o prior art furnace ... teaches the use of a crane support on the cylindrical housing and a crane support on the removable conical end ... so that the [furnace] can be lifted and transported to dump the finished product through the removable end."

Minco's early success cut into CE's market. In 1985, for instance, CE's sales dropped approximately 20%. In response, CE tried to develop a comparable furnace but failed. In December 1983, CE obtained a copy of the '462 patent. Later CE hired an outside consultant, Nick Valk, to design a kiln capable of



matching Minco's high quality silica. In an initial meeting with Valk, CE showed him a drawing similar to one in the '462 patent. With Valk's assistance, CE developed the accused RT kiln. In February \*1114 of 1986, CE began to manufacture fused silica in its RT kiln. With fused silica from the RT kiln, CE's sales volume increased annually.

The accused RT kiln has three sections: a main cylindrical housing, a fixed conical extension off of the main cylindrical housing, and another conical extension which detaches. After firing the silica, a crane lifts the furnace from the drive mechanism. The crane attaches to a support at the center of the cylindrical housing. The entire housing then moves to a sand pan. At the sand pan, an operator loosens the bolts and swings away the removable, conical extension. A crane, through the crane support, holds the extension during detachment. At that point, additional cranes lift and tilt the furnace to dump the ingot of fused silica. Regarding this operation, the trial court found: "[T]he crane support on the detachably secured conical extension ... performs the function of removing or lifting away the extension so that the remainder of the housing can be lifted and tilted via the crane support mounted on the cylindrical section of the housing."

The parties tried the issues in this case to the bench from August 16 to August 23, 1994. The trial court found in favor of Minco. CE appealed to this court. CE contests the trial court's judgment on infringement, intervening rights, best mode, pre-assignment damages, calculation of the reasonable royalty, entitlement to lost profits, and willful infringement. Minco's cross-appeal challenges the trial court's denial of price erosion damages and of lost profits on CE's sale of its business, including the infringing kilns.

### DISCUSSION

The trial court made ample findings of fact upon which this court relies in reaching its decision. Moreover, the trial court's sound legal conclusions permit this court to abbreviate its presentation of many issues. For instance, this court affirms with respect to the willfulness of CE's infringement based on the trial court's findings and conclusions.

[1] With regard to the central issue of nearly every patent appeal, claim construction, the district court reached an interpretation fully supported by the record. See *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, --- - ---, 116 S.Ct. 1384, 1395-96, 134 L.Ed.2d 577, 38 U.S.P.Q.2d 1461, 1470-71 (1996).

Claims 3 and 4 of the '462 patent call for two crane supports--one on the main housing and another on the removable conical extension "for lifting and tilting the housing and removing the contents thereof." Construing this limitation, the trial court held that "both such crane supports [must be] involved in facilitating the lifting and tilting of the housing 'so that' the contents of the furnace ... can be removed out the detachably secured end." The trial court did not construe this language to require that the crane supports actually lift and tilt the furnace housing.

The claim language and the patent specification support this interpretation. The claim language does not require each crane support to actually lift and tilt the furnace housing. The claims specify only use of the crane supports during lifting and tilting. Indeed, as is evident to one of ordinary skill in rotary furnace operations, crane supports alone do not lift a furnace. Rather a crane lifts the weight of the furnace. The supports, by their nature, only facilitate this lifting process by connecting the furnace to the crane.

The specification further supports the trial court's construction. In relevant part, the specification provides: "[U]pon completion of the fusion process, the entire kiln is crane lifted from the driving cradle support 156 and the cone 120' removed, whereupon the kiln is tilted and the formed ingot dumped." This language in the specification discloses that removal of the detachable extension precedes the tilting process. Thus, the district court correctly determined that the patent does not require that the crane support on the detachable end receive force that directly tilts the housing. Rather, the specification suggests that this crane support plays a part in the lifting and tilting process.

In light of its correct claim construction, the district court found that the claims read on the accused RT kiln. This court detects no clear error in this finding of fact. Accordingly, this court affirms the trial

court's finding of literal infringement.

#### **\*1115 Intervening Rights**

[2] The district court denied CE's request for intervening rights due to a change in the language of claim 3 during reexamination. Element D of that claim requires: "[A] crane support mounted upon each said housing and removable conical extension for lifting and tilting the *housing* to remove the contents thereof." During reexamination, Minco substituted the underlined word "housing" for the term "furnace." Minco made this change in response to the examiner's suggestion that the crane did not lift the entire furnace system, including the external drive wheels.

[3][4] Claims, though amended during reexamination, retain their original effective date unless changed in scope from the original patent. *Tennant Co. v. Hako Minuteman, Inc.*, 878 F.2d 1413, 1417, 11 USPQ2d 1303, 1306 (Fed.Cir.1989). This court reviews without deference the district court's conclusion that the reexamined claims remained identical in scope. *Quantum Corp. v. Rodine, PLC*, 65 F.3d 1577, 1580, 36 USPQ2d 1162, 1165 (Fed.Cir.1995), *cert. denied*, 517 U.S. 1167, 116 S.Ct. 1567, 134 L.Ed.2d 666 (1996).

Read in light of the specification, the original claims used the term "furnace" in both a broad sense--the entire apparatus including the drive system--and a narrow sense--the barrel-shaped housing alone. The disputed claim language used "furnace" in the narrow sense as clarified by the specification's reference to lifting the "kiln" from the drive apparatus. Similarly, the specification states that the fusing charge may be "incrementally introduced into the interior of the furnace," that the furnace may be lined with certain material, that a charge is introduced while the furnace is rotating, and that the electrodes are introduced into the furnace. These passages clarify that the patent often used the term "furnace" in the narrow sense of the barrel-shaped housing.

One of ordinary skill in the art would understand, therefore, that the claims did not specify lifting and tilting of the entire furnace system, including the drive mechanisms. Rather, to one of ordinary skill

in the rotary furnace art, the substitution of "housing" for "furnace" merely restated the scope of element D of claims 3 and 4. Accordingly, this court affirms the trial court's decision to permit recovery of damages for the full period of infringement.

#### **Best Mode**

[5][6] A patent specification must "set forth the best mode contemplated by the inventor for carrying out his invention." 35 U.S.C. § 112 (1994). Compliance with the best mode requirement of section 112 focuses on the state of mind of the inventor at the time the inventor files the patent application. *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1050, 34 USPQ2d 1565, 1569 (Fed.Cir.), *cert. denied*, 516 U.S. 988, 116 S.Ct. 516, 133 L.Ed.2d 424 (1995); *see Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1535, 3 USPQ2d 1737, 1745 (Fed.Cir.), *cert. denied*, 484 U.S. 954, 108 S.Ct. 346, 98 L.Ed.2d 372 (1987). Accordingly, the inventor's intent controls. *Glaxo*, 52 F.3d at 1050. The trier of fact determines compliance with the best mode requirement. *Spectra-Physics*, 827 F.2d at 1536; *accord Transco Prods. Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 559, 32 USPQ2d 1077, 1084 (Fed.Cir.1994), *cert. denied*, 513 U.S. 1151, 115 S.Ct. 1102, 130 L.Ed.2d 1069 (1995); *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 680, 7 USPQ2d 1315, 1319 (Fed.Cir.1988). Following a bench trial, this court, in turn, reviews that finding for clear error. *Spectra-Physics*, 827 F.2d at 1536; *accord Amgen, Inc. v. Chugai Pharmaceutical Co.*, 927 F.2d 1200, 1209, 18 USPQ2d 1016, 1024 (Fed.Cir.), *cert. denied*, 502 U.S. 856, 112 S.Ct. 169, 116 L.Ed.2d 132 (1991).

[7][8] To invalidate a patent under the best mode requirement, an accused infringer must show by clear and convincing evidence that the inventor "both knew of and concealed a better mode of carrying out the claimed invention than was set forth in the specification." *Transco*, 38 F.3d at 560; *see Glaxo*, 52 F.3d at 1050 (explaining that the best mode requirement is aimed at preventing concealment by inventors). The record must show that the inventor considered an alternative mode superior to the disclosed \*1116 mode. *See United States Gypsum Co. v. National Gypsum Co.*, 74 F.3d 1209, 1212, 37 USPQ2d 1388, 1390 (Fed.Cir.1996) (best mode analysis asks wheth-



er "the inventor *had* a best mode of practicing the claiming invention") (emphasis added); Glaxo, 52 F.3d at 1050. [FN\*] The inventor need not disclose "production details so long as the means to carry out the invention are disclosed." Transco, 38 F.3d at 560; Wahl Instruments, Inc. v. Acvious, Inc., 950 F.2d 1575, 1581, 21 USPQ2d 1123, 1127 (Fed.Cir.1991).

[FN\*] If the inventor appreciates a best mode for carrying out the invention, invalidity may result from the failure to disclose, regardless of whether the inventor specifically intended to conceal his or her best mode.

See United States Gypsum Co., 74 F.3d at 1215-16, 37 U.S.P.Q.2d 1388 at 1393 (upholding invalidity determination where an executive directed the deletion of the inventor's best mode for the specification).

[9] In this case, the claims specify a crane support on both the housing and the detachable conical extension. The specification does not disclose a preferred number of crane supports. Figure 2 of the patent drawings depicts one crane support off center to the left on the top of the housing and another crane support on the detachable extension.

Minco operated a furnace based on the patent before the filing of claims 3 and 4. On this furnace, Jenkins used two crane supports on the cylindrical housing, one close to each end of the cylindrical housing. Jenkins testified that the dual crane supports kept the load level and steady during transportation of the housing. Jenkins did not build a kiln for Minco with the crane support configuration depicted in the '462 drawing.

Jenkins, however, testified that Minco's crane support configuration was a production decision, not a superior method of operation. Minco opted to use the two-crane-support system because it had added more tires to its drive system. One of ordinary skill in this art knows that the number of drive wheels varies according to the type of mineral in the furnace. In adding wheels to facilitate different minerals, Minco could not locate a crane support off center, as depicted in the drawings. Furthermore, Jenkins specifically testified that he did not intend to conceal a best mode.

[10] Consequently, the record does not show that the trial court committed clear error in finding CE did not prove concealment of the best mode by clear and convincing evidence. Before an inventor can conceal a best mode, the record must first show his appreciation of the superiority of one mode over those modes disclosed in the specification. Glaxo, 52 F.3d at 1050. The trial court was ideally positioned to determine from all of Jenkins' testimony whether he actually regarded Minco's three-crane-support system superior to the two-crane-support system in the patent drawing at the time of filing. Jenkins' testimony showed that he did not appreciate his mode to be better than the disclosed mode. Thus this court detects no clear error in the trial court's finding that CE did not prove a best mode violation by clear and convincing evidence.

#### *Assignment of the Right to Sue for Past Damages*

The patent assignment agreements transferring the '462 patent from Jenkins and Richards to Minco do not explicitly state that they include the right to sue for past infringement. That is, the grant clauses of the final assignment agreements do not contain so-called "magic words"--i.e. "I hereby assign the right to sue for past infringement." Nonetheless, the trial court permitted Minco to recover damages for infringement occurring prior to the date of assignment.

[11][12][13][14] Under the Patent Act, only patentees may bring an action for infringement. See 35 U.S.C. § 281 (1994). Patentees include not only the one to whom the patent issued but also any successors in title. 35 U.S.C. § 100(d) (1994). Parties may transfer patent rights by a legal agreement. CMS Indus., Inc. v. L.P.S. Int'l. Ltd., 643 F.2d 289, 294, 217 USPQ 20, 23 (5th Cir.1981). A conveyance of interests in a patent typically constitutes either an assignment or a mere license. An assignment of patent rights operates to transfer title to the patent, while a license leaves title in the patent owner. \*1117 Waterman v. Mackenzie, 138 U.S. 252, 255, 11 S.Ct. 334, 335, 34 L.Ed. 923 (1891). Thus, an assignee holds title to a patent and may sue for infringement without further permission or clearance. A licensee, however, cannot sue without joinder of the patent owner. *Id.* To create an assignment, a contract must transfer: (1) the entire exclusive patent right, (2) an undivided interest in the

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patent rights, or (3) the entire exclusive right within any geographical region of the United States. Waterman, 138 U.S. at 255, 11 S.Ct. at 335. An agreement that does not transfer one of these three interests is merely a license. *Id.*

[15][16] An assignee may bring an action to redress any violations of the exclusive rights conferred by the patent. 35 U.S.C. § 271 (1994). Infringement, however, harms only the owner of the patent at the time of the infringing acts. See United States v. Loughrev, 172 U.S. 206, 211-12, 19 S.Ct. 153, 155, 43 L.Ed. 420 (1898). Thus, the conveyance of the patent does not normally include the right to recover for injury occurring to the prior owner. Crown Die & Tool Co. v. Nye Tool & Mach. Works, 261 U.S. 24, 43, 43 S.Ct. 254, 259, 67 L.Ed. 516 (1923) (the assignee may sue for past infringement if the "owner assigns the patent and also the claim for past infringements to the same person"); see Arachnid, Inc. v. Merit Indus., Inc., 939 F.2d 1574, 1579 n. 7, 19 USPQ2d 1513, 1517 n. 7 (Fed.Cir.1991) (noting in dicta that the transfer of this right "cannot be inferred from an assignment of the patent itself"). As the Supreme Court stated, it is a "great mistake" to "suppose" that the assignment of the patent carries with it the right to sue for past infringement. Moore v. Marsh, 74 U.S. (7 Wall.) 515, 522, 19 L.Ed. 37 (1868). These cases establish a general rule that the right to sue for prior infringement is not transferred unless the assignment agreement manifests an intent to transfer this right. Neither statute nor common law precedent, however, requires a particular formula or set prescription of words to express that conveyance.

[17][18][19] Determining whether the right to sue for prior infringement has been transferred turns on the proper construction of the assignment agreements, which is a matter of state contract law. In this case, the assignment documents specifically invoke the protections and standards of Tennessee law. In construing contractual language under Tennessee law, written words of intent receive their usual, natural, and ordinary meaning. Taylor v. White Stores, Inc., 707 S.W.2d 514, 516 (Tenn.App.1985). Moreover the entire context of the contract informs the meaning of any particular term. Thus, one provision in the agreement may modify, limit, or illuminate another.

Associated Press v. WGNS, Inc., 48 Tenn.App. 407, 348 S.W.2d 507, 512 (1961).

[20] The assignment documents show that Richards obtained by express language the right to sue for past infringement from Rawles. Therefore, both Jenkins and Richards held the right to sue for prior infringement when they entered into the transactions with MAC. Jenkins and Richards then assigned to MAC all of their rights in the '462 patent, including the right to sue for past infringement. MAC, in turn, assigned all of its interest to Minco. According to this chain of title, Minco possessed the right to sue for infringement which occurred before it acquired title.

CE challenges one link in this chain--the assignment to MAC. The long form assignment from Jenkins and Richards to MAC transferred "all of Assignors' right, title and interest." Under the general rule, the bare reference to all right, title, and interest does not normally transfer the right to sue for past infringement. Moore, 74 U.S. (7 Wall.) at 522. The MAC assignment, however, expressly notes that Richards received all "right, title, and interest" from Rawles, including "all rights of action and damages for past infringement." The express reference to past infringement in the MAC assignment expanded the scope of the term "right, title, and interest" to encompass the right to sue for prior infringement. Indeed, paragraph 6 of the assignment confirms that Jenkins and Richards "do not retain any right to any recoveries for infringement ... [or] to sue in their own name with regard to the [Patent]." In addition, the assignment expressly grants MAC all patent rights "as fully and entirely as the same would have been held and enjoyed by Assignors ... [as if the] agreement \*1118 had not been made." In sum, the entirety of the agreements establishes that the MAC assignment clearly conveyed the right to sue for past infringement.

The patent assignment from MAC to Minco incorporated the terms of the MAC assignment. Thus, this series of agreements clearly transferred to Minco the right to sue for past infringement.

#### *Damages*

CE appeals the trial court's damages award and find-

ing of willful infringement. Minco, in turn, appeals that court's refusal to award lost profits for price erosion in the fused silica market and for compensatory damages for CE's sale of its business, including the infringing RT kilns.

[21] The Patent Act provides for "damages adequate to compensate for the infringement but in no event less than a reasonable royalty for the use made of the invention by the infringer." 35 U.S.C. § 284 (1994).

This court has clarified that adequate damages can include lost profits due to diverted sales, price erosion, and increased expenditures caused by infringement. Lam, Inc. v. Johns-Manville Corp., 718 F.2d 1056, 1065, 219 USPQ 670, 675 (Fed.Cir.1983). Because fashioning an adequate damages award depends on the unique economic circumstances of each case, the trial court has discretion to make important subsidiary determinations in the damages trial, such as choosing a methodology to calculate damages. SmithKline Diagnostics, Inc. v. Helena Lab. Corp., 926 F.2d 1161, 1164, 17 USPQ2d 1922, 1925 (Fed.Cir.1991); King Instrument Corp. v. Otari Corp., 767 F.2d 853, 863, 226 USPQ 402, 409 (Fed.Cir.1985).

[22][23][24] To recover lost profits, however, the patent holder must show that the infringer actually caused the economic harm for which the patentee seeks compensation. Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1545, 35 USPQ2d 1065, 1069 (Fed.Cir.) (en banc), cert. denied, 516 U.S. 867, 116 S.Ct. 184, 133 L.Ed.2d 122 (1995). In the context of lost profits, causation requires evidence of "a reasonable probability that [the patent holder] would have made the asserted profits absent infringement." King Instruments Corp. v. Perego, 65 F.3d 941, 952, 36 USPQ2d 1129, 1137 (Fed.Cir.1995), cert. denied, 517 U.S. 1188, 116 S.Ct. 1675, 134 L.Ed.2d 778 (1996); accord Rite-Hite, 56 F.3d at 1545. This court reviews a trial court's finding of causation for clear error. SmithKline, 926 F.2d at 1165.

[25][26][27] In addition to causation, the patent holder bears the burden of proving the amount of the award. Id. at 1164; Otari, 767 F.2d at 863. Quantum is an issue of fact, which this court reviews for clear error. Mahurkar v. C.R. Bard, Inc., 79 F.3d 1572,

1579, 38 USPQ2d 1288, 1292 (Fed.Cir.1996). Once a patentee shows causation, however, the trial court may resolve doubts underlying the precise measurement of damages against the infringer. Lam, 718 F.2d at 1065; Story Parchment Co. v. Paterson Parchment Paper Co., 282 U.S. 555, 563, 51 S.Ct. 248, 250-51, 75 L.Ed. 544 (1931). Nevertheless, the burden remains on the patentee to prove the amount by a preponderance of the evidence.

[28][29] In awarding both lost profits and a reasonable royalty, the trial court used the sale of fused silica as the baseline for measuring damages. The assessment of adequate damages under section 284 does not limit the patent holder to the amount of diverted sales of a commercial embodiment of the patented product. Rather, the patent holder may recover for an injury caused by the infringement if it "was or should have been reasonably foreseeable by an infringing competitor in the relevant market, broadly defined." Rite-Hite, 56 F.3d at 1546; accord Perego, 65 F.3d at 950. In this case, the invention produced marketable fused minerals. Both CE and Minco used the invention to compete in that market. Therefore, CE should have reasonably foreseen that infringement of the '462 patent would harm Minco's sales in the fused silica market. This court accordingly upholds the trial court's determination to use that measure of damages.

#### Lost Profits

[30] The district court found that Minco showed entitlement to lost profits on diverted \*1119 sales of fused silica. In determining quantum, that court found that CE's infringement caused Minco to lose the sales of 26,201,956 pounds of fused silica, over the period from May 1988 through July 1990. These lost sales amounted to \$3,455,329 in lost profits.

CE challenges these findings by asserting that the market featured non-infringing alternatives to the '462 patent. A non-infringing alternative in the fused silica market would make it less likely that the patentee would have made the sales to CE's customers without the infringement. Rite-Hite, 56 F.3d at 1548. The district court, however, found that Minco's fused silica product from the '462 patent was in significant demand. The record shows a prefer-

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ence for Minco's quality, fused silica in the market. Indeed, the record shows that two other primary fused silica manufacturers had bowed out of the market "in deference" to the '462 patent. Before use of the infringing RT kiln, the record shows that the market considered CE a source of "last resort." Thus, the record amply supports the district court's finding that Minco had a reasonable probability of making these sales but for the infringement.

CE's damages expert testified that CE could easily have designed around the patent by employing a cradle apparatus that could tip the furnace after a clamp removed the detachable end. However, testimony that an infringer might have been able to design around a patent does not, in itself, defeat a claim for lost profits. In spite of CE's litigation protestations, evidence showed it chose to copy the Minco kiln rather than pursue one of the plentiful, hypothetical, *post hoc*, non-infringing alternatives. In this case, CE's expert based his opinion on the testimony of a CE witness who testified that CE knew that cradle support systems could substitute for the crane supports. The record, however, does not show the marketplace use of this purported substitute either by CE or any other fused silica manufacturer.

Based on the record in its entirety, the trial court did not err in concluding that absent the infringement, CE would not have been able to compete effectively against Minco. The record also supports the district court's finding that Minco would have been able to make the additional sales of 26,201,956 pounds of fused silica during the 1987-1990 period. With these findings in place, the trial court properly awarded lost profits.

#### Reasonable Royalty

[31][32] The Patent Act permits damages awards to encompass both lost profits and a reasonable royalty on that portion of an infringer's sales not included in the lost profit calculation. *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1577, 12 USPQ2d 1026, 1028 (Fed.Cir.1989), *cert. denied*, 493 U.S. 1022, 110 S.Ct. 725, 107 L.Ed.2d 744 (1990). A segment of the infringer's sales may not warrant a lost profits award because the patentee cannot establish causation for that segment. *Perego*, 65 F.3d at

952-53. For instance, a patent owner may not operate in the specific geographical area covered by the infringer or may not have had the manufacturing or marketing capacity to make the infringer's sales. *See id.* However, the patentee would still be entitled to a reasonable royalty on each of those sales. 35 U.S.C. § 284 (1994).

In this case, the district court awarded a reasonable royalty on CE sales beyond 95% of Minco's manufacturing capacity from May 1988 through July 1990. Minco also received a reasonable royalty on CE sales from 1986 through April 1988, during which CE produced a blended fused silica. In total, the district court awarded a reasonable royalty on approximately 122,329,000 pounds of fused silica.

[33][34] A district court may calculate a reasonable royalty by postulating a hypothetical negotiation between a willing licensor and licensee at the time infringement commenced. *Mor-Flo*, 883 F.2d at 1580. This hypothetical construct seeks the percentage of sales or profit likely to have induced the hypothetical negotiators to license use of the invention. In this case, the district court awarded Minco a royalty rate of 20% on the gross value of CE's applicable sales. The district court based this relatively high royalty on a number of findings. First, Minco and CE competed head-to-head. Second, at the time of infringement, CE had an inferior \*1120 product. Third, the market contained no non-infringing alternatives. Fourth, CE itself regarded the invention as a significant advance. Fifth, the industry enjoyed high rates of profit. The trial court found that CE realized an earnings before interest and taxes rate of 22.4% of sales under the jumbo kiln technology. Sixth, CE's earnings before taxes increased substantially after its use of the accused furnaces.

In addition to the court's other findings, because the industry enjoyed high profitability and the invention produced higher quality fused silica, this court detects no clear error in the district court's royalty award. The economic evidence on this point supports the finding that these hypothetical negotiators might have entered a license calculated at 20% of sales.



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#### Price Erosion Damages

[35] Minco sought and the trial court denied further lost profits based on the decrease in the price of fused silica. To prove price erosion damages, a patentee must show that, but for the infringement, it would have been able to charge higher prices. BIC Leisure Prods., Inc. v. Windsurfing Int'l, Inc., 1 F.3d 1214, 1220, 27 USPQ2d 1671, 1675 (Fed.Cir.1993).

[36] The record discloses price fluctuations in the fused silica market. For instance, Minco's average price for fused silica in 1988 was \$0.269 per pound, an increase from \$0.2530 in 1987. However, the price of fused silica decreased in 1989 to \$0.255 and to \$0.220 in 1990. CE converted to infringing kilns in November 1987. By April 1988, CE sold only fused silica from the RT kilns. Nevertheless, Minco's average selling price increased in 1988. This evidence permits the inference that market forces other than infringement influenced the price of fused silica. Furthermore, the record suggests that Minco was the market leader in cutting prices. Although the trial court might have found that Minco cut prices in response to CE's infringement, the record allows other inferences as well. Moreover, the record lacks probative economic evidence that consumers would have tolerated higher prices in 1989 and 1990. Thus, the record supports the district court's finding that price erosion damages were too speculative.

Minnesota Mining & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc., 976 F.2d 1559, 24 USPQ2d 1321 (Fed.Cir.1992), does not compel a different result.

In *Minnesota Mining*, the fact finder determined that the patentee could have increased prices 2% per annum without infringement. *Id.* at 1578. With that record and that finding, this court affirmed price erosion damages. *Id.* at 1579. *Minnesota Mining*, however, does not compel price erosion damages whenever prices decrease in a market consisting primarily of the patent holder and the infringer.

In sum, the district court weighed the record evidence on the economic factors influencing price and determined that infringement did not cause those price decreases which occurred during the infringement period. This court detects no clear error in that find-

ing.

#### Lost Profits on CE's Sale of its Business

[37] Finally, Minco challenges the district court's denial of compensatory damages for CE's sale of its fused silica business to Imetal, a French corporation, on July 31, 1990. Minco seeks as damages the difference between the sales price of CE's business and its expert's valuation of CE's business without the infringing kilns. On this theory, Minco seeks an additional \$34,634,527. Alternatively, Minco claims some damages on the sale to Imetal. The district court denied any recovery "based upon the lack of evidence in this case to support this element of damages."

Minco's theory values the sale of the infringing kilns, only a portion of CE's assets, at approximately \$34 million. According to Minco, had CE not infringed its patent, Imetal would have purchased Minco instead. While in theory Minco might have been entitled to some recovery from CE's sale of its business because it included the infringing kilns, the district court specifically determined that Minco did not show that the infringing kilns were an important factor in the sale. Indeed, upon acquiring CE's business, Imetal switched to its own patented furnace in December 1991. This switch undermines \*1121 Minco's claim that the kilns drove the sale. The record contains no probative evidence of Imetal's business motivations or the industry context. For example, Imetal might have paid a large premium for entry into the market or for CE's trademark. Thus, Minco did not prove Imetal would have purchased it absent CE's infringement.

Furthermore, assuming that CE profited through its sale from the goodwill built up through the use of the infringing kilns, Minco did not show entitlement to compensation beyond its proofs of lost profits and reasonable royalties. The district court's reasonable royalty award already compensates Minco for any goodwill CE garnered by infringement. The district court awarded Minco a generous royalty rate precisely because Minco and CE were head-to-head competitors. The district court reasoned that "CE's desire to maintain its market share would compel [it] to accept [a high royalty]." Thus, the district court



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already acknowledged in its retroactive, hypothetical license that CE was paying in part for the goodwill acquired by infringement.

The danger that an award stemming from the sale of CE would constitute a double recovery is apparent from an examination of the evidence relied on by Minco's expert. In proffering his assessment of CE's enhanced value, Minco's expert relied on the increase in CE's gross profit percentage during infringement. However, the district court had already factored the invention's ability to increase profits into its reasonable royalty calculation. Minco's theory for recovery based on the sale of CE, presented at trial, ignored the goodwill that would have naturally inhered from CE's licensing of the patent for the majority of its sales.

Viewed another way, the trial court determined that, under a hypothetical royalty negotiation in 1986, CE might have paid a high royalty to Minco for its use of the kilns in exchange for Minco's agreement to receive no additional royalty should CE sell its business. See *Mahurkar*, 79 F.3d at 1580. Of course, Minco could sue any purchaser who used the infringing kilns. 35 U.S.C. § 271 (1994). This view of the negotiations corresponds with the evidence and the theories forwarded by Minco.

Accordingly, this court detects no clear error in the trial court's finding that Minco did not show a basis for additional damages from CE's sale of its business. Minco has the burden of proving the amount, if any, of its entitlement. See *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 895 F.2d 1403, 1406, 13 USPO2d 1871, 1874 (Fed.Cir.1990). Minco did not carry that burden. See *id.* at 1406-8 (affirming award of minimal damages when no reliable proof of a reasonable royalty was present); *Devex Corp. v. General Motors Corp.*, 667 F.2d 347, 362-63, 212 USPO 643, 657 (3d Cir.1981) (affirming award of no royalty), *aff'd on other grounds*, 461 U.S. 648, 103 S.Ct. 2058, 76 L.Ed.2d 211 (1983).

### CONCLUSION

Because the decision of the trial court on the issues of claim construction, intervening rights, and the assign-

ment of the right to sue for past damages is free of legal error, and because the record supports each of the findings of the trial court under the clearly erroneous standard of review, this court affirms its judgment.

### COSTS

Each party shall bear its own costs.

*AFFIRMED.*

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